Non-linear dynamics of small quantum systems in ultrashort laser fields

L. A.A. Nikolopoulos

School of Physical Sciences and NCPST, Dublin City University, Collins Ave, D9, Dublin, Ireland

In this talk I’ll review the theoretical and computational approaches currently in use in our group for the ab-initio description of the dynamics of small quantum systems under intense electromagnetic fields [1-4]. Following this review I’ll present some characteristic examples of our work for the cases of atomic hydrogen, neon and molecular hydrogen ion. Recently we have extended our methods to nano-sized systems such as the two-electron quantum dots under THz fields. I take this opportunity to discuss briefly our findings for this case as well.

Figure 1: Electronic radial current probability density, \( j_r(r_b, \theta, t) \), of the atomic hydrogen’s time-dependent wave function at a fixed radius \( r_b =6 \) a.u. under a 10 cycles laser pulse, of peak intensity \( 10^{15} \) W/cm\(^2\), carrier photon energy, 10 eV, of envelope \( \sin^2 \) laser pulse. The electric field is linearly polarized along the z - axis (\( \theta = 0^\circ \) direction).

References


\(^1\)E-mail: Lampros.Nikolopoulos@dcu.ie